IN THE CLAIMS

We claim:

1. A copper alloy, consisting essentially of, by weight:

from 0.15% to 0.7% of chromium;

from 0.005% to 0.3% of silver;

from 0.01% to 0.15% of titanium;

from 0.01% to 0.10% of silicon;

up to 0.2% of iron;

up to 0.5% of tin; and

the balance copper and inevitable impurities.

2. The copper alloy of claim 1, consisting essentially of, by weight:

from 0.25% to 0.6% of chromium;

from 0.015% to 0.2% of silver;

from 0.01% to 0.08% of titanium;

from 0.01% to 0.10% of silicon;

less than 0.1% of iron;

up to 0.25% of tin; and

the balance copper and inevitable impurities.

3. The copper alloy of claim 2 having a maximum of 0.065% of titanium.

4. The copper alloy of claim 2 having a minimum of 0.05% of titanium.

5. The copper alloy of claim 2, consisting essentially of, by weight:

from 0.3% to 0.55% of chromium;
from 0.08% to 0.13% of silver;
from 0.02% to 0.065% of titanium;
from 0.02% to 0.05% of silicon;
from 0.03% to 0.09% of iron;
less than 0.05% of tin; and
the balance copper and inevitable impurities.

6. The copper alloy of claim 1 wherein a ratio, by weight, of iron to titanium, Fe:Ti, is from 0.7:1 to 2.5:1.

7. The copper alloy of claim 6 where Fe:Ti is from 0.9:1 to 1.7:1.

8. The copper alloy of claim 6 wherein at least a portion of the iron is replaced with cobalt on a 1:1, by weight, basis.

9. The copper alloy of claim 1 wherein the zirconium content is essentially zero.

10. The copper alloy of claim 1 having a Quality Function Deployment, QFD, value in excess of 50 for both automotive and multimedia applications.

11. The copper alloy of claim 1 further containing from 0.05% to 0.2%, by weight, of magnesium.

12. The copper alloy of claim 10 formed into an electrical connector.

13. The copper alloy of claim 12 formed into a box-type connector.

14. The copper alloy of claim 10 formed into a leadframe.

15. The copper alloy of claim 1 formed into a rod.

16. The copper alloy of claim 1 formed into a wire.

17. A process for forming a copper alloy having high electrical conductivity, good resistance to stress relaxation and isotropic bend properties, comprising the steps of:

casting a copper alloy that contains, by weight, from 0.15% to 0.7% of chromium and the balance copper and inevitable impurities;

hot working said copper alloy at a temperature of between 700°C and 1030°C;

cold working said copper alloy to a thickness reduction of from 40% to 99% in thickness; and

annealing said copper alloy in a first age anneal at a temperature of from 350°C to 900° for from 1 minute to 10 hours.

18. The process of claim 17 wherein said cast copper alloy further contains from 0.005% to 0.3% of silver, from 0.01% to 0.15% of titanium, from 0.01% to 0.10% of silicon, up to 0.2% of iron and up to 0.5% of tin.

19. The process of claim 18 wherein said hot working is hot rolling at a temperature of between 750°C and 1030°C to form a strip and a solution anneal at a temperature of from 850° to 1030° for from 10 seconds to 15 minutes followed by a quench from a temperature in excess of 850°C to less than 500°C is interposed between said hot working and said cold working.

20. The process of claim 19 wherein said hot rolling is at a temperature of from 900°C and 1020°C and is followed by a water quench.

21. The process of claim 19 wherein said solution annealing step is a strip anneal at temperature of from 900°C to 1000°C for from 15 seconds to 10 minutes.

22. The process of claim 21 wherein said solution annealing step is at a temperature of from 930°C to 980°C for from 20 seconds to 5 minutes.

23. The process of claim 21 including a second age anneal subsequent to said first age anneal wherein said second age anneal is at a temperature of from 300°C to 450°C for from one hour to 20 hours.

24. The process of claim 23 wherein said first age anneal is at a temperature of from 350°C to 550°C for from 1 hour to 10 hours.

25. The process of claim 24 wherein said first age anneal is at a temperature of from 400°C to 500°C and said second age anneal is at a temperature of from 350°C to 420°C.

26. The process of claim 25 wherein said first age anneal is for from one to three hours and said second anneal is for from five to seven hours.

27. The process of claim 24 including the step of forming an electrical connector having improved resistance to stress relaxation following said second age anneal.

28. The process of claim 21 including the steps of cold rolling and stress relief annealing following said first age anneal.

29. The process of claim 28 wherein said cold rolling following said first age anneal is 10% to 50% reduction in thickness and said stress relief anneal is at a temperature of from 200°C to 500°C for from 10 seconds to 10 hours.

30. The process of claim 28 including the step of forming an electrical connector from said copper alloy following said stress relief anneal.

31. The process of claim 24 including the steps of cold rolling and stress relief annealing following said second age anneal.

32. The process of claim 31 wherein said cold rolling following said second age anneal is for a 10% to 50% reduction in thickness and said stress relief anneal is at a temperature of from 200°C to 500°C for from 10 seconds to 10 hours.

33. The process of claim 32 including the step of forming an electrical connector from said copper alloy following said stress relief anneal.

34. A process for forming a copper alloy having high electrical conductivity, good resistance to stress relaxation and isotropic bend properties, comprising the steps of:

casting a copper alloy that contains, by weight, from 0.15% to 0.7% of chromium and the balance copper and inevitable impurities via a continuous process whereby said copper alloy is cast as a strip with a thickness of from about 0.4 inch to 1 inch:

cold rolling said strip to a thickness effective for strip solution annealing.

solution annealing said strip at a temperature of between 850°C and 1030°C for from 10 seconds to 15 minutes;

quenching said solution annealed strip from a temperature in excess of 850°C to less than 500°C;

cold working said copper alloy to a thickness reduction of from 40% to 80% in thickness; and

annealing said copper alloy in a first age anneal at a temperature of from 350°C to 900° for from 1 minute to 10 hours.

35. The process of claim 21 wherein said casting step forms a rectangular ingot that is reduced to strip by hot rolling followed by a cold work inducing cold rolling step.

36. The process of claim 35 where in said cold work inducing cold rolling step said strip is reduced in thickness by from 25% to 90%.

37. The process of claim 36 including a stress relief anneal step following said cold work inducing step, said stress anneal step being at a temperature of 200°C to 500°C for from 10 seconds to 10 hours.

38. The process of claim 37 including the step of forming an electrical connector having high strength and high electrical conductivity following said stress relief anneal step.

39. The process of claim 18 wherein said hot working is extruding at a temperature of between 700°C and 1030°C to form a rod of said copper alloy.

40. The process of claim 39 wherein said hot extruding is at a temperature of between 930°C and 1020°C and is followed by a water quench.

41. The process of claim 39 wherein said cold working is extrusion with a thickness reduction of up to 98% and said annealing is at a temperature of from 350°C to 900°C for from 1 minute to 6 hours.

42. The process of claim 41 wherein said cold working and said annealing steps are repeated at least one additional time.

43. The process of claim 42 wherein said rod is cold extruded for a thickness reduction of up to 98% following a last of said annealing steps.

44. The process of claim 43 including forming a rod having high strength and high electrical conductivity.

45. The process of claim 43 including forming a wire having high strength and high electrical conductivity.

46. The process of claim 17 wherein said hot working is hot rolling at a temperature of between 750°C and 1030°C to form a strip and a solution anneal at a temperature of from 850° to 1030° for from 10 seconds to 15 minutes followed by a quench from a temperature in excess of 850°C to less than 500°C is interposed between said hot working and said cold working.

47. The process of claim 46 wherein said hot rolling is at a temperature of from 900°C and 1020°C and is followed by a water quench.

48. The process of claim 46 wherein said solution annealing step is a strip anneal at temperature of from 900°C to 1000°C for from 15 seconds to 10 minutes.

49. The process of claim 48 wherein said solution annealing step is at a temperature of from 930°C to 980°C for from 20 seconds to 5 minutes.

50. The process of claim 48 wherein said first age anneal is at a temperature of from 350°C to 550°C for from 1 hour to 10 hours.

51. The process of claim 49 wherein said first age anneal is at a temperature of from 400°C to 500°C and said second age anneal is at a temperature of from 350°C to 420°C.

52. The process of claim 51 wherein said first age anneal is for from one to three hours and said second anneal is for from five to seven hours.

53. The process of claim 48 including the steps of cold rolling and stress relief annealing following said first age anneal.

54. The process of claim 53 wherein said cold rolling following said first age anneal is 10% to 50% reduction in thickness and said stress relief anneal is at a temperature of from 200°C to 500°C for from 10 seconds to 10 hours.

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